ISLAND FOX RECOVERY RECOMMENDATION
FROM THE CHANNEL ISLAND FOX RECOVERY COORDINATION GROUP

TECHNICAL ANALYSIS REQUEST TITLE AND NUMBER IDENTIFICATION

Urgent Technical Analysis Related to Technical Analyses 3.1 and 3.3: Determine whether, how and where to release captive-bred foxes this fall and, if no releases, develop contingency plans that may include establishing mainland populations or expanding existing on-island populations.

Relates to: San Miguel, Santa Rosa, Santa Cruz and Santa Catalina
Technical Expertise Groups involved: PM, CP, WP, R, G, FH[1]

DATE October 4, 2004

EXECUTIVE SUMMARY

The Recovery Coordination Group (RCG) has concluded that the most critical objective in the recovery of the four endangered subspecies of Channel Island fox is to increase the size of their populations as soon as possible in order to minimize demographic instability and loss of genetic diversity. Increasing the size of the populations is the most advantageous way of achieving long-term recovery and preventing extinction by stochastic events. We have concluded that the three listed fox populations on the northern Channel Islands are each currently too small and lack the genetic diversity necessary to support viable recovery. The fastest way to grow the populations at present is to retain the captive populations until they have reached the desired target number (to be determined by an on-going analysis) and to improve captive breeding production.

Task Force 3 recommended partial release of pups and adults on San Miguel and Santa Rosa Islands, no release on Santa Cruz Island, and full release of all pups born in 2004 on Santa Catalina Island in October of 2004. After careful review of the Technical Analysis Response to the Urgent Technical Analysis Related to Technical Analyses 3.1 and 3.3, delivered by Task Force 3 on August 3, 2004, the Recovery Coordination Group recommends retention of all captive foxes on the northern Channel Islands; we delay recommendations concerning Santa Catalina Island captive fox releases until the Population Viability Analysis for that subspecies has been peer reviewed.

Although the supporting rationale for the retention recommendation on the northern Channel Islands varies slightly amongst the islands, there is an overriding concern that the risk of predation of released captive-bred foxes by golden eagles is currently unacceptably high. Moreover, it is not possible to predict how predation risk may change with the onset of the Santa Cruz Island feral pig eradication. In light of the risks, we consider the conservative approach to be retention of all captive foxes in 2004.

The Recovery Coordination Group is aware that there may be economic consequences or other constraints to carrying out the no-release recommendation for the northern Channel Islands. In

[1] Population Modeling, Captive Population Management, Wild Population Management, Reintroduction, Genetics, Fox Health

the event that the no-release strategy is infeasible, *Contingent Recommendations* for each island are provided. Even if the *Contingent Recommendations* are implemented, however, the RCG recommends that new pens be constructed in the event that mitigation action is required (e.g., should eagle predation rates rise during the Santa Cruz Island feral pig eradication).

BACKGROUND

A major threat to the persistence of island fox subspecies endemic to the northern Channel Islands is the small size of all three populations. The minimum viable population for each subspecies has yet to be determined, but conventional guidance suggests that the population sizes required for the conservation of genetic diversity are likely to exceed those currently in existence for each listed subspecies. Since the loss of genetic diversity from small populations depends both on population size and on the time spent at a small population size, that is the bottleneck, rapid expansion of all three island fox populations is an immediate priority. Target population sizes will be determined by population viability analyses to be completed by April 2005. However, as captive breeding facilities are currently at or above capacity on all three northern islands, there is an urgent need to make recommendations concerning the most appropriate management of foxes that cannot be accommodated in existing facilities.

Three alternatives have been identified: 1) expansion of on-island facilities, 2) release of some captive foxes, and 3) movement of a proportion of foxes to mainland facilities. As the third option is not achievable before the 2005 breeding season, this document focuses on elucidating which of the first two options is most likely to further the short-term goal of rapidly expanding the three northern populations. Concurrently, we are initiating a Technical Analysis Request to investigate the possibility of establishing a mainland captive breeding population for one of more of the subspecies during 2005.

The determination of whether a "release" or "retention" strategy is optimal for meeting the short-term goal of rapidly increasing the size of the existing populations is dependent on the relative growth rates of captive versus wild populations. We acknowledge that, while data are available on population growth rates in captivity, no data are available on the potential growth rates of wild populations on Santa Rosa and San Miguel Islands because (i) there is currently no wild population on San Miguel Island and (ii) the wild population on Santa Rosa Island is currently too small to evaluate its reproductive potential. One pair that failed to breed in captivity on Santa Rosa Island successfully raised pups in the wild in 2004. This might indicate that reproductive success could be higher in the wild relative to captivity, but it is difficult to draw conclusions from a single incident.

Predation by golden eagles on released foxes persists and has varied across the northern islands, with much higher predation rates on Santa Cruz Island. We have no data to indicate that the risk of golden eagle predation has diminished. Moreover, these risks might change on all three northern islands during the course of feral pig eradication, scheduled to commence on Santa Cruz Island in 2005. We have little expectation that the predation by golden eagles will decrease in the short term.

These variable and unpredictable impacts of golden eagle predation on released fox must be balanced against the low population growth rates that have been recorded in captive populations. Comparisons with breeding success on Santa Catalina Island and inspection of the northern captive breeding facilities by the RCG in August of 2004 suggest that there is opportunity for improvement in the reproductive rates of the captive populations in the northern islands. We will implement a study to evaluate correlates of successful breeding, with a view to enhancing fox reproductive rates on the northern islands.

In the absence of an identified optimal target population size and reliable data on which of the two options (release or retention) will best meet the short-term goal of rapid population expansion, we recommend that an increase in the captive populations is more likely to foster recovery. Since the effects of captivity on population growth rates are likely to be easier to mitigate than effects of release, we recommend retention of all captive foxes in 2004. This recommendation contrasts with the recommendations of Task Force 3. The reasons for our differing interpretation are threefold. Given our stated objective of increasing the size of all populations, we believe that 1) we have insufficient data to evaluate scientifically the costs and benefits of a release versus a retention strategy, 2) the risk of eagle predation on released foxes is still too high, and 3) reproductive rates in captivity could be improved significantly. While our primary recommendation (see below) does not accord with that of Task Force 3, their analysis, along with that of Varsik and Lynch (2004, *unpublished draft*), has informed our *Contingent Recommendations* (see below).

RECOMMENDATION AND SUPPORTING ANALYSES

Northern Channel Islands

Recommendation 1: Retention of all captive foxes on the northern Channel Islands in the fall of 2004

The recommendation for retention of all captive foxes on the northern islands was the group's majority decision. The trade-off between the potential for higher breeding success in the wild versus higher mortality in the wild was discussed at length, especially in light of the imminent eradication of pigs on Santa Cruz Island, which may increase predation risk across the northern islands in the short term. Preliminary risk analyses of movement of island foxes concluded that expansion of on-island captive breeding facilities is the most optimal, short-term captive breeding strategy in terms of island fox production (Fritcher and Mazet 2004). The analysis concluded that if expansion of on-island facilities is not feasible, mainland captive breeding is preferred quantitatively over release of pups into the wild, given the current level of golden eagle predation. Based on initial review of this report, it is our preliminary conclusion that the short-term releases may hinder the long-term recovery efforts by undermining the long-term viability of the remaining captive population and its ability to meet production goals. Without completion of Technical Analyses 3.1 and 3.3, we lack the information needed for a comparative analysis of the risks associated with various options and, therefore, are recommending what we believe to be the most conservative approach of retention of all captive foxes now and a renewed focus on completion of the analyses.

Recommendation 2: Construction of new pens on all three northern Channel Islands with or without releases
We are aware that there are negative consequences of not releasing foxes this year (e.g., prolonged conditioning to captivity, potential loss of reproductive potential if reproductive rates are higher are in the wild, cost of constructing new pens, cost of managing additional captive foxes, risks inherent to captivity including catastrophe). The risk to a released population is difficult to predict and difficult to mitigate. The risk to a captive population is more chronic, but there is the potential to modify breeding facilities to enhance productivity (see Recommendation 3). In the meantime, we recommend constructing new pens to accommodate this season's production and to accommodate wild foxes should they need to be brought into captivity. On San Miguel, Santa Rosa and Santa Cruz Islands, material will have to be obtained for new pen construction. On San Miguel, the 12 pups born in 2004 may be placed temporarily in quarantine pens (6 each) until new breeding pens are built.

Recommendation 3: Conduct a correlation analysis of captive breeding success to date to aid captive breeding management
Given the low breeding rates in captivity on most islands in most years, we recommend a study be conducted to identify the characteristics (physical, mate-pair, maintenance, feeding, care, etc.) of the current facilities that correlate with high breeding success across all islands and all years. Such an analysis will lead to recommendations for changes to the configuration and management of the current facilities to improve captive breeding success. We will take the lead on assigning and implementing the study.

Recommendation 4: Develop a Technical Analysis Request for a mainland captive breeding strategy that will include roles and responsibilities, a flow diagram, and timeline (the RCG will develop this Request).

Contingent Recommendations for the Northern Channel Islands

While the RCG recommends retention of all captive foxes this year, the group also understands there may be economic or logistical constraints to constructing the pens necessary to accommodate the lead recommendation in the time available. We also recognize there may be advantages to releasing foxes in 2004, such as 1) population growth rates might be higher in the wild, 2) releases may provide an opportunity to compare alternative release methods, 3) releases may provide a measure of the current risk of eagle predation, 4) releases may reduce risk of catastrophic events to captive populations, and/or 5) released foxes might avoid potential loss of the natural behaviors in captivity that facilitate survival and fitness in the wild. These potential advantages were discussed but did not outweigh the concerns raised above. Therefore, in the case that *Recommendation 1* above cannot be implemented, the RCG has developed Contingent Recommendations to guide limited releases of the captive-bred foxes on the northern Channel Islands.

Contingent Recommendation 1: Construction of new pens on all three northern Channel Islands with or without releases to accommodate emergency response
We recommend the construction of new pens as soon as possible on each of the northern Channel Islands in the event that it is necessary to return foxes to captivity (see *Recommendation 2* above).

Contingent Recommendation 2: No releases of captive foxes on Santa Cruz Island
Five of the nine captive-bred foxes released on Santa Cruz Island in the fall of 2003 were killed by golden eagles within the first month of release. The remaining four captive-bred foxes were brought back into captivity soon after. We have no information that the risk of golden eagle predation has diminished.

Contingent Recommendation 3: Limited releases on San Miguel Island
On San Miguel, only the number of foxes needed to alleviate facility constraints should be released. Since interactions between wild and captive foxes have resulted in injury and are believed to have reduced reproductive rates on Santa Rosa and Santa Catalina Islands, measures for maintaining separation between the wild and captive fox populations should be implemented as soon as possible. "Soft-release" and post-release monitoring protocols should be developed and peer-reviewed as soon as possible. If these protocols are not completed in time for the release, then the best available information from this effort should be used. Soft-release protocols should include initial supplemental feeding and monitoring of condition, as these measures appear to have contributed to the success of pup releases on Santa Catalina Island. Monitoring should include the number of live/dead, habitat use and choice, patterns of movements and activity. Releases should occur early in the fall season (October to early November) to correspond with natural dispersal phenology and to allow foxes to establish prior to the period of assumed higher eagle predation risk (i.e., the eagle breeding season).

Releases should follow the specific recommendations developed in the Population Management Plan by Varsik and Lynch (2004, *unpublished draft*).

Monitoring should be of sufficient sensitivity to enable the recapture trigger points to be detected promptly and to prevent additional mortalities from eagles. Data from mortalities of captive-bred released foxes on Santa Cruz Island in December 2003 may be used to guide monitoring frequency.

Contingent Recommendation 4: Limited releases on Santa Rosa Island
On Santa Rosa Island, only the number of foxes needed to alleviate facility constraints should be released. Since interactions between wild and captive foxes have resulted in injury and are believed to have reduced reproductive rates on Santa Rosa and Santa Catalina Islands, measures for maintaining separation between the wild and captive fox populations should be implemented as soon as possible. "Soft-release" and post-release monitoring protocols should be developed and peer-reviewed as soon as possible. If these protocols are not completed in time for the release, the best available information from this effort should be used. Soft-release protocols should include initial supplemental feeding and monitoring of condition. Monitoring should include the number of live/dead, habitat use and choice, patterns of movements and activity. Releases should occur early in the fall season (October to early November) to correspond with

natural dispersal phenology and to allow foxes to establish prior to the period of assumed higher eagle predation risk (i.e., the eagle breeding season).

Releases should follow the specific recommendations developed in the Population Management Plan by Varsik and Lynch (2004, *unpublished draft*).

We have a concern about the interaction between the Santa Rosa Island game cull and the release and monitoring of released foxes. Gut-piles and carcasses from the hunt need to be carefully managed so as not to create a food resource attractant and subsidy for golden eagles.

Santa Catalina Island

Recommendation 5: Peer review of the existing PVA for certification
The RCG has already recommended a complete and thorough review and refinement of the Santa Catalina Population Viability Analysis using state-of-the-art methods. The RCG will review the results from the PVA to determine next steps.

Recommendation 6: *To the greatest extent possible, information should be collected from any releases of captive-bred foxes on Santa Catalina Island so as to contribute to successful releases on the northern Channel Islands.*

PRESENTATION OF MINORITY OPINION ON RECOMMENDATIONS FOR THE NORTHERN CHANNEL ISLANDS

There is not a clear advantage for recovery between housing an additional year's production on Santa Rosa and San Miguel Islands, or releasing and monitoring animals excess to present capacity. The first choice may yield more rapid population growth, which is of great value in retaining the genetic complement and improving population structure. The second choice poses a more uncertain population outcome but has the potential to provide valuable information about predation rates, acclimation to the wild conditions, dispersal, and unconfined reproduction. These require a well-conceived monitoring protocol.